

CARVER

CM-1090 Integrated Amplifier

Owner's Manual

CARVER

CARVER

Powerful · Musical · Accurate



The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure, that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user of the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

Safety Instructions

1. Read Instructions -- All the safety and operation instructions should be read before the Carver Component is operated.
2. Retain Instructions — The safety and operating instructions should be kept for future reference.
3. Heed Warnings — All warnings on the Component and in these operating instructions should be followed.
4. Follow Instructions — All operating and other instructions should be followed.
5. Water and Moisture — The Component should not be used near water - for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, etc.
6. Ventilation — The Component should be situated so that its location or position does not interfere with its proper ventilation. For example, the Component should not be situated on a bed, sofa, rug, or similar surface that may block any ventilation openings; or placed in a built-in installation such as a bookcase or cabinet that may impede the flow of air through ventilation openings.
7. Heat — The Component should be situated away from heat sources such as radiators, or other devices which produce heat.
8. Power Sources — The Component should be connected to a power supply only of the type described in these operation instructions or as marked on the Component.
9. Power Cord Protection — Power-supply cords should be routed so that they are not likely to be walked upon or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit the Component.
10. Cleaning — The Component should be cleaned only as recommended in this manual.
11. Non-use Periods — The power cord of the Component should be unplugged from the outlet when unused for a long period of time.
12. Object and Liquid Entry — Care should be taken so that objects do not fall into and liquids are not spilled into the inside of the Component.

13. Damage Requiring Service — The Component should be serviced only by qualified service personnel when:

- A. The power-supply cord or the plug has been damaged; or
- B. Objects have fallen, or liquid has spilled into the Component; or
- C. The Component has been exposed to rain; or
- D. The Component does not appear to operate normally or exhibits a marked change in performance; or
- E. The Component has been dropped, or its cabinet damaged.

14. Servicing — The user should not attempt to service the Component beyond those means described in this operating manual. All other servicing should be referred to qualified service personnel.

15. To prevent electric shock, do not use this polarized plug with an extension cord, receptacle or other outlet unless the blades can be fully inserted to prevent blade exposure.

Pour prévenir les chocs électriques ne pas utiliser cette fiche polarisée avec un prolongateur, un prise de courant ou une autre sortie de courant, sauf si les lames peuvent être insérées à fond sans en laisser aucune partie à découvert.

16. Grounding or Polarization - Precautions should be taken so that the grounding or polarization means of the Component is not defeated.

PORTABLE CART WARNING



Carts and stands - The Component should be used only with a cart or stand that is recommended by the manufacturer. A Component and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the Component and cart combination to overturn.

17. Internal/External Voltage Selectors — Internal or external line voltage selector switches, if any, should only be reset and re-equipped with a proper plug for alternate voltage by a qualified service technician. See an Authorized Carver Dealer for more information.

18. Attachment Plugs for Alternate Line Voltage (Dual voltage models only)— See your Authorized Carver Dealer for information on the attachment plug for alternate voltage use. This pertains to dual-voltage units only.

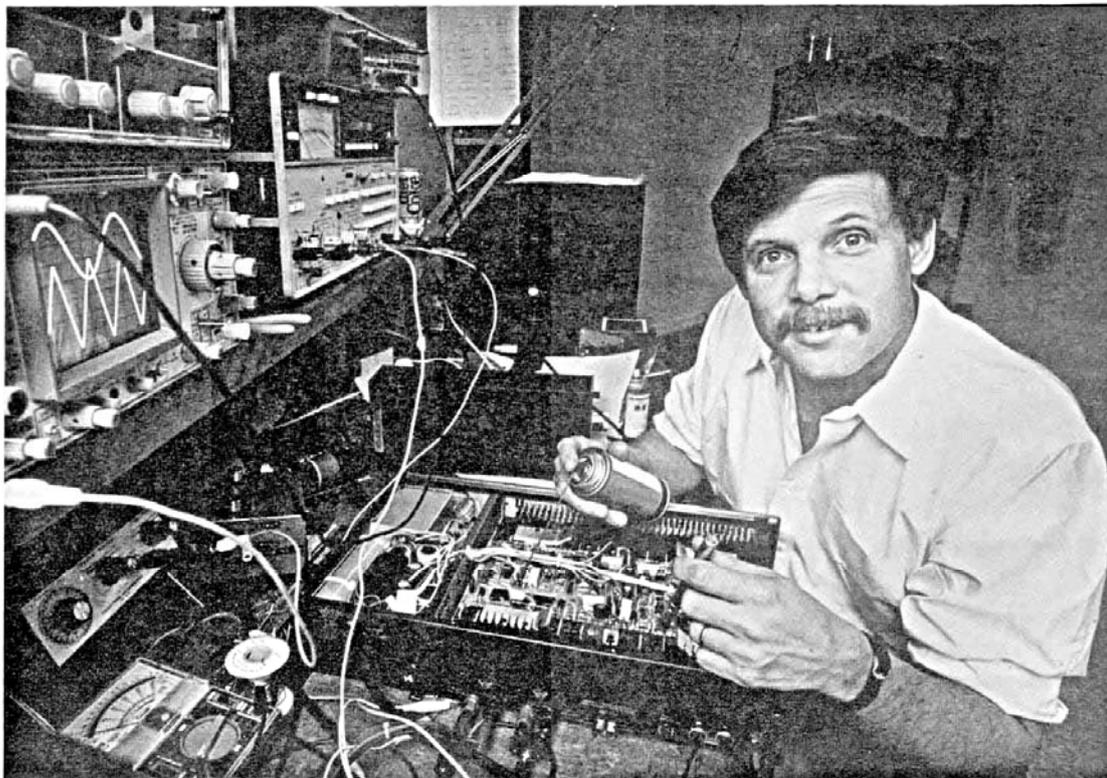
This digital apparatus does not exceed the Class A/Class B (whichever is applicable) limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of the Canadian Department of Communications.

ATTENTION – Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de class A/de class B (selon le cas) prescrites dans le règlement sur le brouillage radioélectrique édicté par les ministere des communications du Canada.

WARNING – To reduce the risk of fire or electric shock, do not expose this appliance to rain or moisture.

Introduction

A Message from Bob Carver



At the heart of your CM-1090 is the patented Carver Magnetic Field Amplifier section. Judged against conventional amplifier standards, it is second to none: its sound quality is smooth, sweet and dynamically accurate and it can deliver

simultaneous high current and high voltage to speaker loads ranging from two ohms to eight ohms. This amplifier design is also remarkably efficient. It can momentarily "assign" unused power from one channel to the other when required.

Secondly, we have integrated an advanced version of our patented Sonic Hologram Generator. The Sonic Holography® Sound Processing System will increase listening pleasure and enjoyment by bringing a completely new perspective to your favorite music. It will bring you an actual improvement in the quality of listening via complex processing of the stereo signals, and a

change in relationships between the listener and loudspeakers. Now, instead of flat, between-the-loudspeaker imaging associated with conventional stereo, Sonic Holography® will paint a musical picture that's remarkably believable and convincing. You will experience a heightening of perceived depth, as well as width.

Once again, thank you for choosing Carver. I am proud to present to you the best in craftsmanship and design.

Robert W. Carver
Chairman of the Board, Carver Corporation

Dear Carver Customer,

Thank you for choosing Carver electronics. We at Carver Corporation realize that there is an abundance of home electronics from which to choose, and that the differences between the various models are not always apparent at first glance. Carver strives to produce for you the finest in audio reproduction equipment, components which integrate the latest and best technology yet remain as competitive as possible in price.

Your new CM-1090 Sonic Holography® Integrated Amplifier includes two of our unique technologies, each of which will enhance your listening enjoyment.

Contents

Safety Instructions 2

Introduction 4

1 Prior to Installation 6

 Unpacking 6

 Important Paperwork 6

2. Front Panel 7

 Signal Path Controls 8

 Source Selection and Dubbing 8

 Taping Procedures 9

3. Rear Panel 10

4. Remote Control 12

 Batteries 12

 Remote Operation 12

 Remote Functions 12

5. Installation 13

 Placement 13

 Connections 13

6. Set-Up for Sonic Holography® 15

 Initial Loudspeaker/Chair Placement 15

 Basic Set-Up Steps 16

 A Properly Functioning Image in Sonic Holography® 16

 A "Test Flight" 16

 Fine Tuning 17

 Room Examples 18

 Loudspeaker Designs and Early Reflections 18

7. About Sonic Holography® 20

8. Technical Information and Service Assistance 22

 Specifications 22

 Patent Notice 22

 Cleaning 22

 Troubleshooting 22

 Service Assistance 23

1. Prior to Installation

Unpacking

Carefully unpack your CM-1090 and keep the original carton and packing materials for moving, shipment, or long-term storage.

Upon opening the box, please check for any visible sign of damage that did not appear on the outside of the box. If you do encounter what appears to be concealed damage, please consult your Carver Dealer before proceeding to further unpack or install the unit.

Important Paperwork

Make sure to save your sales receipt. It is extremely important to establish the duration of your Limited Warranty and for insurance purposes.

Next, make a note of the serial number which is located on the back of the CM-1090. Record it in the space provided below for convenient reference.

Model **CM-1090**

Serial Number: _____

Purchased at: _____

Date: _____

Finally, take a moment to fill out and return the Warranty Card that came with your CM-1090 and return it to Carver.

2. Front Panel

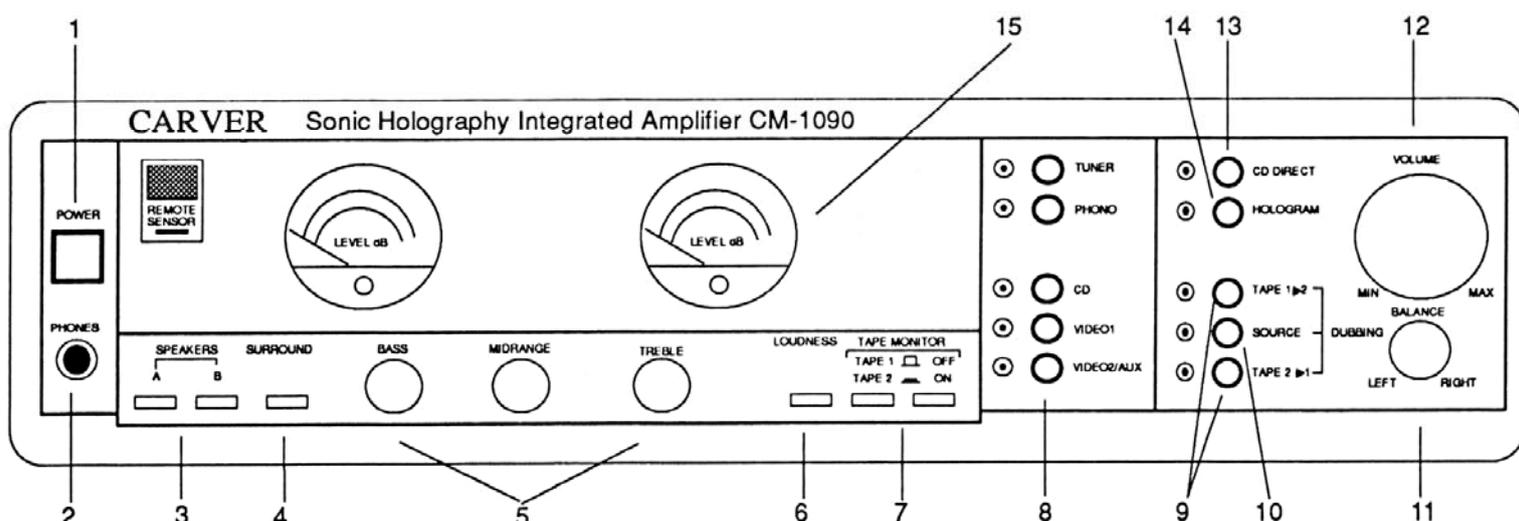


Figure 1 Front Panel

The following is a brief description of the function of each CM-1090 Integrated Amplifier front panel button and control. See Figure 1.

1. Power Switch. This is the CM-1090's ON/OFF switch. It also affects the SWITCHED convenience receptacle on the back of the unit. The CM-1090 employs an electronic "clammer" to mute the main outputs and headphone output during turn-on and turn-off. This reduces loud transients which could damage a speaker system. This muting system will turn off the signal to your power amplifier:

- A) For about 3 to 5 seconds after initial power-on, whether by the front panel power switch or from a remote or timed switch.
- B) Immediately at turn-off, whether by the power switch or by external switches.

2. Headphone Jack. All conventional dynamic headphones may be plugged in here. Headphone impedance may be from a few ohms to several thousand ohms, although output level may vary depending on impedance. The headphone jack is

driven by a separate internal amplifier designed to provide the correct voltage and current gain needed. The signals present at the headphone jack are identical to those at the CM-1090's outputs and are thus affected by tone controls, etc. It is recommended that headphones be unplugged from the CM-1090 when not being used to avoid risk of damage to them at high volume settings.

For private headphone listening, do not depress either SPEAKER A or SPEAKER B buttons.

15. Power Meters. The CM-1090 employs ballistically-weighted analog power meters which are calibrated in Volume Unit (VU) dB, and two logging scales. The logging scales are meant to be used as relative indications of amplifier output voltage. The primary Volume Unit scale indicates +3dB as its top value, showing 0dB to be equal to 100 watts for sine waves. Meter ballistics include a specified amount of over-shoot which is the standard of Volume Units. Therefore, on much musical material, the meter will often go past 0dB and all the way to +3dBW. At this point, the CM-1090 headroom will be exhausted. Because different musical material interacts differently

with the ballistics of the meter, the best way to tell if the amplifier is overloaded is to simply listen. If you hear distortion at the same time the meter is "pegging", you have probably exhausted the CM-1090's power reserves.

Signal Path Controls

3. A/B Speaker Switches. Your Carver integrated amplifier has two sets of speaker outputs on its back panel. You may connect two sets of speakers* and play either or both of them at the same time. To play the speakers connected to Speaker Outputs A, press the SPEAKERS A button. If the SPEAKERS A button is left in when the SPEAKERS B button is also depressed, sound will be routed to both sets of speakers at once. If the SPEAKERS A button is returned to its OUT position, only the B speakers will play.

*NOTE: We do not recommend playing two sets of 4-ohm speakers at the same time, although you can certainly hook up two pairs and play each pair individually. If you're not sure of the Rated Nominal Impedance of your speakers, consult the owner's manual which came with the speakers, or call the manufacturer or your dealer.

Even if you are only using one set of speakers, the Speaker Switch is useful when playing records. Turning off the SPEAKERS A switch when changing discs protects your system from damage caused by accidental tonearm drops, yet eliminates having to re-adjust the volume control each time a new record is played. MUTE, a similar feature is available on the CM-1090's remote control.

4. Surround. The CM-1090 lets you use the "B" set of speaker output terminals to provide rear channel ambience. This is a matrix surround sound effect created with L-R and L+R portions of the stereo signal. While it should not be confused with true Dolby™ Surround Sound, SURROUND can provide a dramatic 3-dimensional spaciousness that enhances many types of music and video soundtracks. The rear channel speakers do not need to be as large as your front channel speakers.

If you are using the "B" speaker outputs for a second set of speakers in another room, don't use the SURROUND button. Since it has been processed, the "B" speaker output will sound very odd without front stereo channels in the same room.

5. Treble, Midrange and Bass Tone Controls. The CM-1090 features 3-band tone equalization. In addition to bass and treble, a midrange control has been provided. It is especially useful for making vocals more distinct or conversely, "backing off" recordings which have so much midrange that they are aurally fatiguing. Note that at the center detent position, the three controls produce no boost or cut. Maximum rotation in either direction produces ± 8 dB of

equalization with band centers at 100Hz, 1kHz, and 10kHz.

6. Loudness. This is a special equalization circuit designed for realistic music reproduction at low, "background" listening levels. Due to certain characteristics of the human ear, we aren't as sensitive to high and low frequencies at modest sound levels as we are to midrange frequencies. The loudness circuit compensates for this by boosting high and low frequencies, creating a more balanced sound at background listening levels.

7. Tape 1 and Tape 2 Monitors. These buttons activate the CM-1090's two tape monitor loops. When one or the other is pressed in, you will be able to hear playback from the cassette deck which is connected to that tape monitor loop. If you have an outboard signal processor, such as a Carver ECS-U, equalizer or surround sound decoder, it would be plugged into the tape monitor loop.

NOTE: Silence will result if a TAPE MONITOR button is pushed in when the deck is not playing or if there is no deck connected to that tape monitor loop.

12. Balance Control. Adjusts the left/right distribution of sound to your speakers. It is useful when one speaker is closer to your listening position than the other, or with some poorly recorded material which has more of one channel than the other. The sweep of the CM-1090's BALANCE control is intentionally not linear. That is, small movements off center produce smaller shifts in the stereo image per degree of rotation than near the extreme left and right positions. This makes slight adjustments more convenient.

11. Volume Control. This function is also available on the remote control included with your integrated amplifier.

Source Selection and Dubbing

8. Input Source Selection Buttons. The CM-1090 gives you a choice of up to seven different sound sources. Tape inputs work in a slightly different way and so are not grouped with the Input Source Selector buttons. The other five sources are selected by pressing one of the source buttons. An appropriate LED will light up next to the sound source button you have pushed (or selected by remote control).

TUNER is provided for connection to a stereo tuner.

PHONO is designed to receive the input of standard moving magnet cartridges which produce at least 5 mV of signal.

VIDEO 1 and VIDEO 2 are intended for the stereo outputs of a VCR, laser disc player or stereo TV tuner. Note, however, that both the VIDEO and CD inputs may be used with any line level audio

source if you don't happen to have one of the components listed. Instead you could substitute a satellite video sound input, a second CD player, etc.

NOTE: If either TAPE 1 or TAPE 2 buttons are pushed in, you will not directly hear any of the six sound inputs. If you've pushed the DUBBING - SOURCE button, their sound will be routed through the appropriate tape monitor loop for recording (and if the deck is turned on and in RECORD, the sound will be routed back through the tape monitor loop for monitoring purposes). PHONO, CD, VIDEO 1 and VIDEO 2/AUX may also be selected from the remote control.

9. Dubbing - Tape 1→2 and 2→1. The CM-1090 provides you with inputs and outputs for two tape decks. The DUBBING switches allow you to copy material from one cassette deck to another without changing any patch cords.

10. Dubbing - Source. When this button is pressed, one of the CM-1090's input sources (PHONO, TUNER, CD, etc.) will be routed to either TAPE 1, TAPE 2 or both for recording. To hear the results while the recording is being made, press the appropriate TAPE MONITOR button.

13. CD Direct. While the CM-1090's electronics are unusually noise and distortion-free, some serious listeners wish to hear a CD through the shortest possible signal path. Pressing the CD DIRECT button eliminates the Sonic Hologram Generator and tone control circuitry between the CD input and the CM-1090's power amplifier stage. Only BALANCE and VOLUME are operable. We encourage you to experiment with this option.

14. Hologram. This button activates the Sonic Holography® sound processing circuits in the CM-1090. This feature is also available via the remote control unit.

NOTE: It is not possible to achieve the full and proper effects of Sonic Holography® without reading the section of this owner's manual which contains instructions and recommendations concerning placement of loudspeakers and listening chair.

Taping Procedures

Tape monitor loops and dubbing can get pretty confusing. Since they make use of loops which go out and then back into the integrated amplifier, having the wrong button pressed in (or out) can leave you in silence. To make things easier, the following examples cover positions of the tape

monitor and dubbing buttons in some common applications.

DESIRED FUNCTION: Play a cassette connected to TAPE 1.

Switch	Position
TAPE MONITOR 1	ON
TAPE MONITOR 2	OFF
DUBBING - TAPE 1→2	OFF
DUBBING - TAPE 2→1	OFF
DUBBING - SOURCE	OFF
INPUT SIGNAL	Pushing one of these buttons has no effect as long as TAPE MONITOR 1 is pushed in and a tape is playing.

DESIRED FUNCTION: Record a CD onto a cassette deck connected to TAPE 1.

Switch	Position
TAPE MONITOR 1	ON to monitor the recording while in progress. OFF to hear the CD as it is going into the cassette deck.
TAPE MONITOR 2	OFF
DUBBING - TAPE 1→2	OFF
DUBBING - TAPE 2→1	OFF
DUBBING - SOURCE	ON
INPUT SIGNAL	CD source selected.

DESIRED FUNCTION: Make a copy of a tape by dubbing from Deck 1 to Deck 2.

Switch	Position
TAPE MONITOR 1	ON to "cue up" the tape being copied. OFF during the dubbing process.
TAPE MONITOR 2	ON during the dubbing process.
DUBBING - TAPE 1→2	ON
DUBBING - TAPE 2→1	OFF
DUBBING - SOURCE	OFF
INPUT SIGNAL	Pushing one of these buttons has no effect as long as TAPE MONITOR 1 button is pushed IN and a tape is playing.

3. Rear Panel

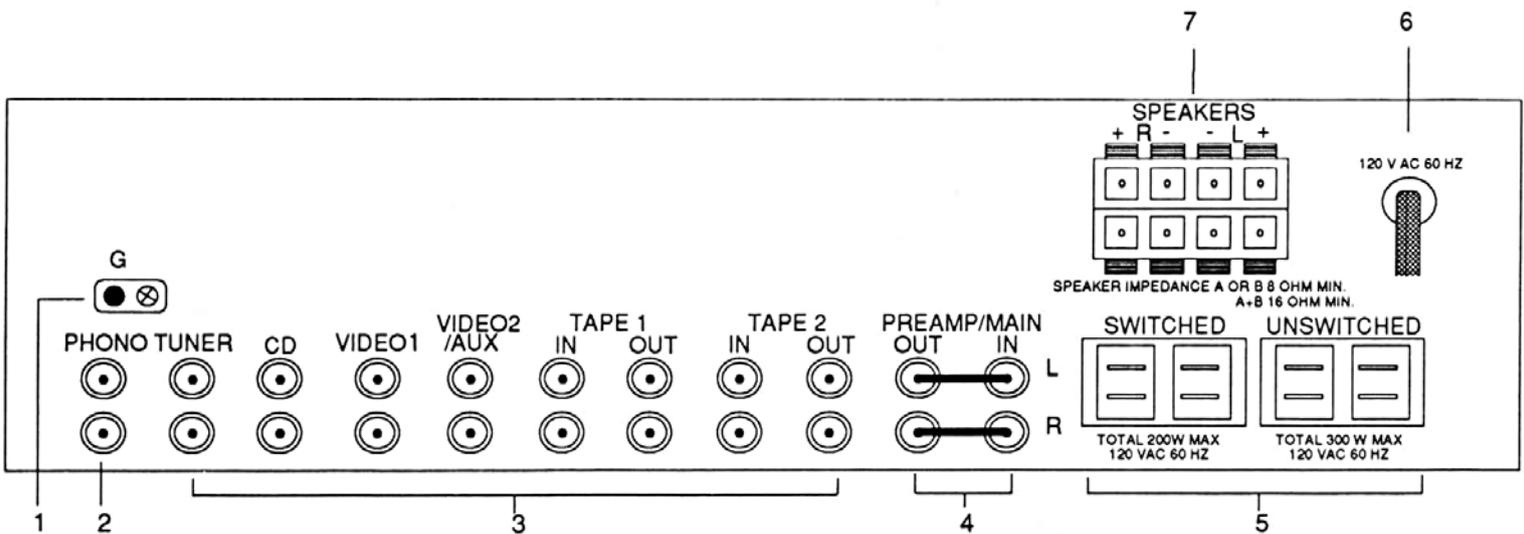


Figure 2 CM-1090 Rear Panel

Most of the inputs and outputs on the back of the CM-1090 are self explanatory. The following are descriptions of connections which may require further consideration.

2. Phono Input (M/M). This phono circuit has a total gain of 36db, appropriate for moving magnet cartridges. Its input impedance consists of 47K ohms resistance in parallel with a capacitance of 150pf. If you are using a low-output moving coil cartridge, you will need a step-up device such as the Carver MC-T.

NOTE: Do not plug line level inputs such as CD players, tape decks, VCR's etc. to this input. Severe overloading and distortion will result.

1. Ground. If your turntable has a separate grounding lead (usually a single wire terminated with a spade lug), connect it to this screw terminal.

3. Inputs. Here is where you connect your other components. Remember that the CD and VIDEO (sound) inputs may actually be used for any components with a line-level output.

7. Speaker Inputs. Two sets of speakers may be connected here. Make sure that the polarity "+" and "-" of each speaker wire is the same at the speaker and at the CM-1090. Care should also be taken not to connect two sets of 4-ohm impedance speakers if you intend to play both sets at once.

4. Preamp/Main Connections. The PREAMP outputs and MAIN inputs allow you to make use of the CM-1090's preamplifier and power amplifier functions independently. For example, you may want even MORE power by upgrading to a Carver Magnetic Field Power Amplifier but want to keep the preamplifier functions of the CM-1090. By connecting the CM-1090's PREAMP outputs directly to a power amplifier, you have totally bypassed the internal amplifier in the CM-1090.

It is, however, still available for other purposes. You could route the PREAMP outputs to an outboard 2-way electronic crossover. This device would separate the ultra-low frequencies and then route them back into CM-1090's MAIN inputs (the rest of the frequency spectrum would be amplified by a larger, separate power

amplifier). Then a subwoofer could be connected to the CM-1090's speaker terminals while the main speakers were driven by a separate power amplifier. Another application is for 4-channel Surround Sound. After the signal leaves the CM-1090's PREAMP outputs, it would enter a Surround Sound Decoder. Front channel signals would be sent to a larger power amplifier; rear channels would be returned through the CM-1090's MAIN inputs and amplified. Consult your Carver dealer for other possible upgrades and applications for the PREAMP/MAIN connections.

6. AC Line Cord. The CM-1090 is designed to be plugged into a properly polarized output (see Safety Instructions 17 and 18 at the beginning of this manual). The CM-1090 may be attached to an extension cord or multiple outlet plug, provided they have the proper polarization (one wider and one narrower prong). If you are using an extension cord, we recommend 16 gauge or heavier.

5. Convenience outlets. Four additional AC outlets are provided on your Carver integrated amplifier. The ones marked SWITCHED are only live when the CM-1090's power switch is pushed. They are useful for other components which you use every time you play your system. Two UNSWITCHED AC outlets are also provided. These outlets are always live as long as the CM-1090 is plugged into the wall. A device plugged here may be left permanently on, or may be switched off with its own switch.

NOTE: In order to avoid turn-on transients, devices plugged here should either be powered up BEFORE the CM-1090 is turned on, or while the SPEAKER A/SPEAKER B buttons are in their OUT positions.

NOTE: The total power drain on these receptacles should not exceed 500 watts.

4. Remote Control

Batteries

The CM-1090's wireless infrared remote requires two AAA batteries. Remove the battery compartment door on the back of the remote control by sliding it outward parallel to the surface of the remote. Insert the batteries supplied, making sure to match the positive (+) and negative (-) ends as indicated by the diagram inside the battery compartment.

Remote Operation

The remote control unit will work in a range of approximately 20 feet in front of and about 30 degrees to either side of the CM-1090. If the remote control begins to occasionally not respond, 1) check its batteries; 2) make sure the infrared projection area on its tip is clean; 3) check that the integrated amplifier's infrared remote sensor square is not dirty or blocked from direct line-of-sight contact with the remote.

Remote Functions

1. Source functions. These include PHONO, CD, VIDEO 1 and VIDEO 2/AUX. When either the AM or FM button is depressed, the CM-1090 selects the tuner inputs.

2. Sound Control Functions. Along with VOLUME UP and DOWN, there are buttons for activating SONIC HOLOGRAPHY® circuits and muting the CM-1090's sound. When depressed, the MUTE button reduces the integrated amplifier's volume level by 90%. Pressing it again, restores the previous sound level.

3. CD Transport Functions. The remote control may be used to activate four functions of any Carver compact disc player: PLAY, PAUSE/STOP (depending on whether the button is pressed once

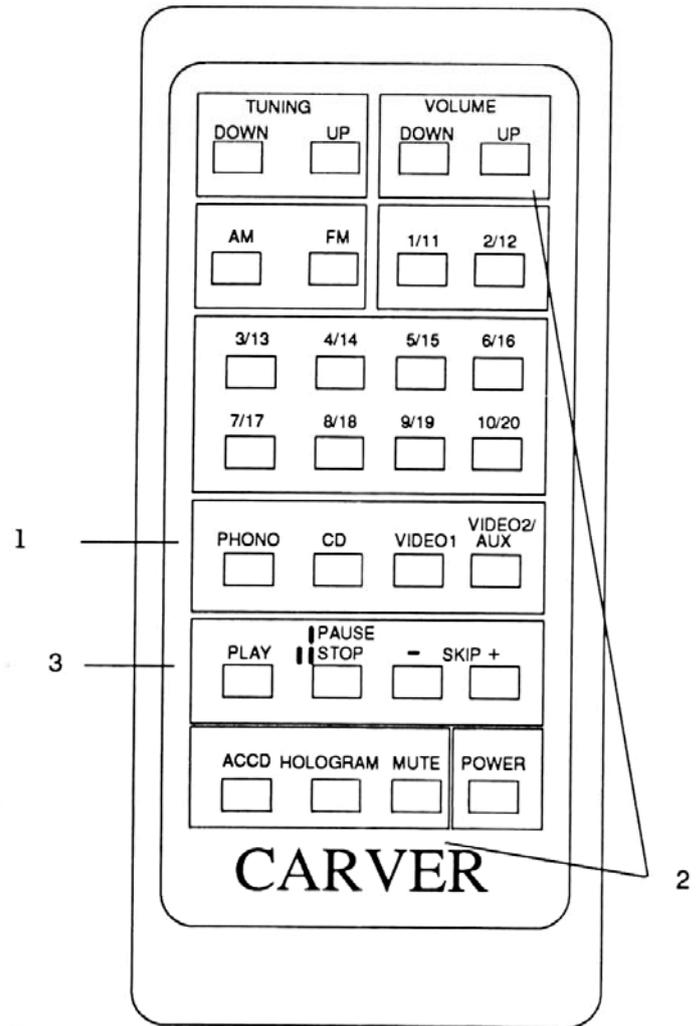


Figure 3 Remote Control

or twice) and SKIP which lets you skip ahead or back through the tracks on a CD.

NOTE: The remote buttons dealing with tuner control are fully functional with Carver's TX-12 Tuner. These buttons include AM, FM, TUNING DOWN/UP, ACCD and the ten preset buttons labeled 1/11 through 10/20.

5. Installation

Placement

The CM-1090 is a solid state device and can be placed in any position including vertically. Heat, at least in normal amounts, shouldn't be any problem for the integrated amplifier. Its Magnetic Field Power Amplifier section doesn't generate enough of its own to be a danger to other components. However, you should be sure not to block its ventilation areas by setting other components directly on top of it.

Connections

Figure 4 shows a typical system built around the CM-1090.

The following tips will help you get the most out of your system:

- Make sure all components are OFF before making any connections.
- Use high quality interconnects. Cheap, worn or frayed patch cords will not only degrade the sound, but can be a source of hum and RF noise as well. Special higher-quality interconnects are available in many grades. These are often used from CD-to-integrated amplifier connections. Consult your Carver dealer for more information.
- Double-check that "left's go to left's and right's go to right's". It is general practice to use RED patch cord plugs for RIGHT channel connections and WHITE or

BLACK patch cord plugs for LEFT connections. Whatever way you choose, remain consistent while hooking up all of your components.

- Make sure that turntable input cables are well away from both power cords and speaker wires to eliminate the possibility of induced hum.
- Use thick wire for speaker connections. We recommend at least 16 gauge "zip cord". Or ask your Carver dealer about special higher quality, oxygen-free speaker cable.
- When connecting speaker wires, first twist the wire's conductors into a tight spiral so that no loose strands stick out. Just one tiny strand can cause a short circuit.
- Use the same length of speaker wire for both speakers, even if one is closer to the integrated amplifier than the other. Coil up the excess away from the CM-1090's turntable inputs.
- Be VERY careful to make sure that the left and right "-" and "+" CM-1090 speaker terminals are connected to the "-" and "+" terminals on the corresponding right and left speakers. Double-check these connections! If polarity isn't correct, you will experience poor stereo imaging and muffled, weak bass.

CM-1090 Sonic Holography Integrated Amplifier

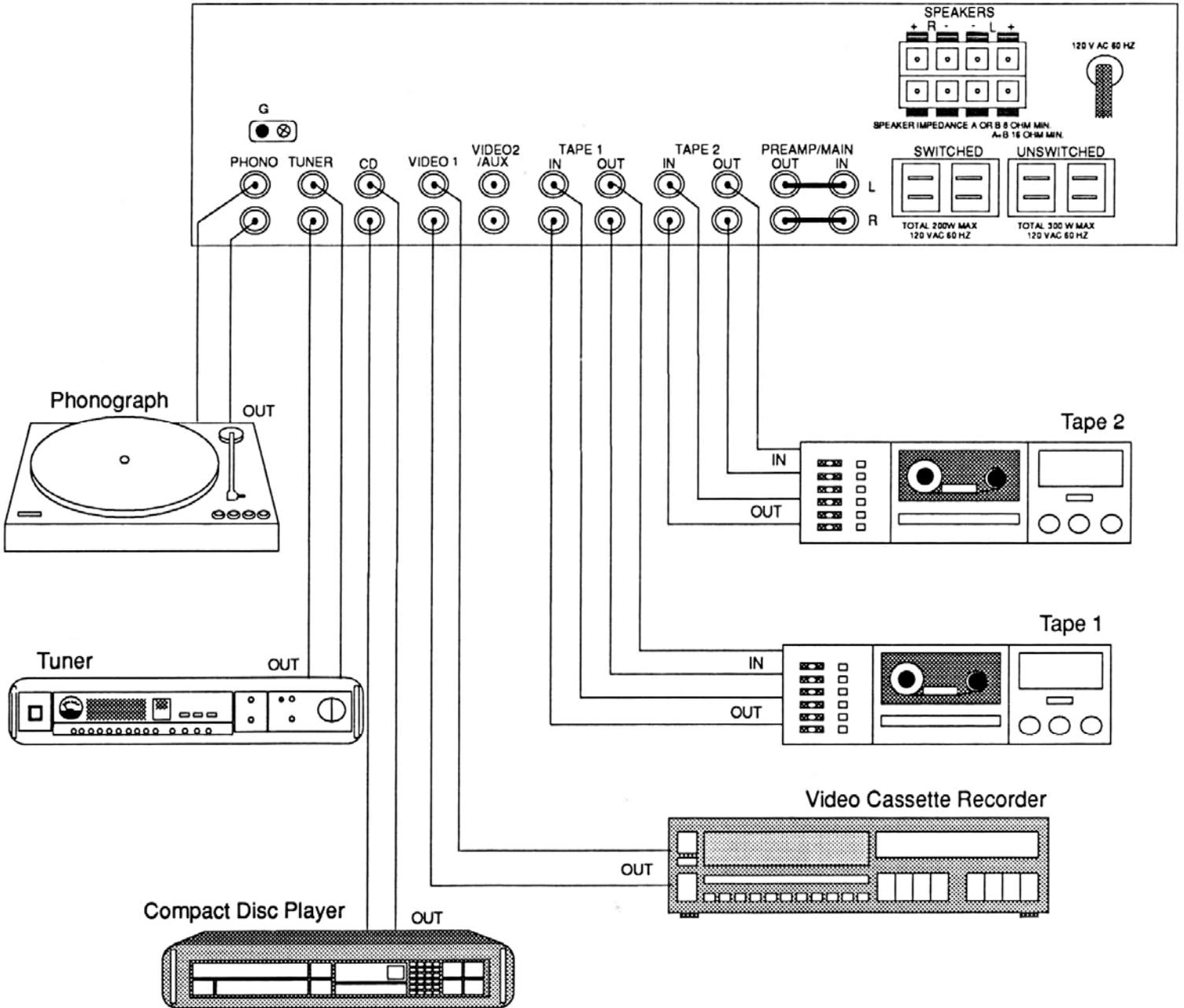


Figure 4 Sample System Connections

6. Set-Up for Sonic Holography®

After installing and connecting the CM-1090 to the rest of your stereo system, you'll probably be tempted to begin playing music and playing around with controls. We urge you to resist this temptation for the moment. If you decide to try it anyway, not much will happen because you're only part way there. Successful Sonic Holography® depends on proper loudspeaker placement and other important factors. Read the following section and follow the instructions and recommendations exactly.

Initial Loudspeaker/Chair Placement

Making Sonic Holography® work properly requires attention to many factors that usually aren't problems or considerations for normal stereo playback. The two most important factors are 1) accurate relationships between the loudspeakers and listening chair, and 2) dealing with reflected sound off surfaces in the listening room.

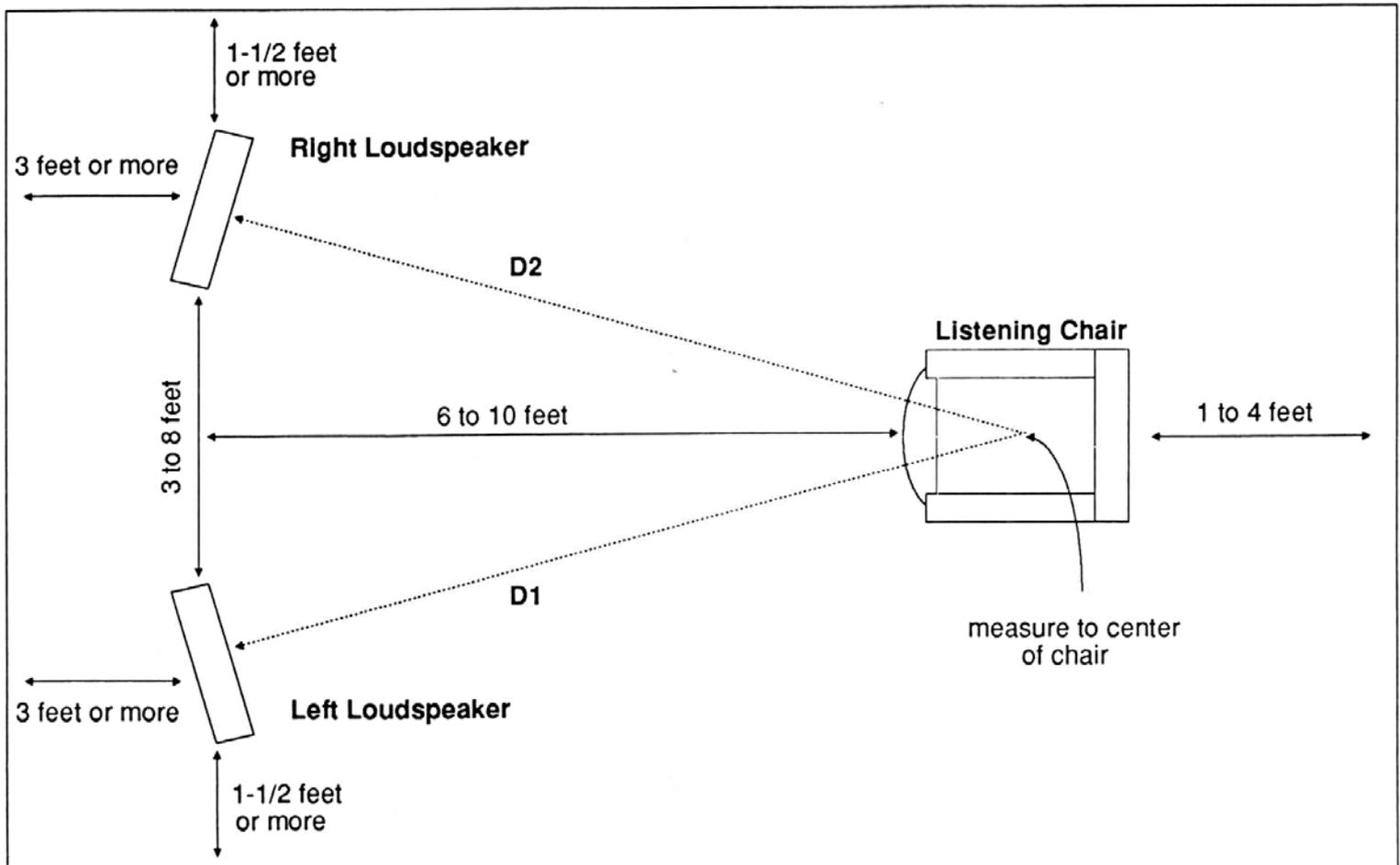


Figure 5 Initial Set Up

The real keys to this process are the relationships between the loudspeakers and chair. While minimizing room reflections is almost as important, a musical image in Sonic Holography® will never occur unless the loudspeaker/listening chair relationship is achieved accurately and correctly.

It might seem impractical, or a lot of trouble and effort, but you'll be amply rewarded by the stunningly live imaging Sonic Holography® brings to your favorite music.

Basic Set-Up Steps

To perform the set-up, you'll need a steel tape measure and listening chair. Refer to Figure 5 and follow this 5-step procedure:

1. Make sure the loudspeakers are away from side and rear walls as indicated in the drawing.
2. Move the loudspeakers so they are exactly six feet apart and on direct axis with the listening chair with direct sound from both panels.
3. Adjust the toe-in of the speakers so that the inner edge is ONE INCH closer to you than the outer edge.
4. Place your listening chair so that it is not directly against the rear wall of the listening room.
5. Carefully measure the distance from the CENTER of the left speaker's top woofer to the CENTER of the listening chair. Repeat the measurement for the right speaker. Adjust the chair so that both distances (D1 and D2 in Figure 5) are exactly the same. Accuracy within 1/4 INCH is desired.

The goal of these steps has been to place the listening chair at a point equidistant from both loudspeakers. This places a seated listener on what can be called the "stereo axis." Being on this acoustic centerline is very important to hearing a musical image in Sonic Holography®. If you've followed the above instructions, a seated listener in the chair should have a ready-made window for initial experiments with the Sonic Holography® Sound Processing System. You'll undoubtedly have to make some minor adjustments but this should get things going.

A Properly Functioning Image in Sonic Holography®

Before listening to some musical selections in Sonic Holography®, you should know what you will be listening for. With correctly positioned loudspeakers and listening chair, the Sonic Hologram Generator system should cause musical instruments and other sound sources to

spread out in a large 45° to 95° arc in front of you. Sound images will exist to the left and right, extending well beyond the limits of the loudspeakers and, occasionally, all the way to the extreme left and right. You'll be able to perceive a sonic stage depth of 10 to 20 feet with sound images clearly floating behind and, from time-to-time, in front of the loudspeakers. You can actually turn your head and look at the sound images; these images will seem to stay put in space. Some sound images may even seem to clearly emerge from outside the walls of the listening room.

A "Test Flight"

So far, this manual has discussed the "nuts and bolts" of Sonic Holography®. If you've correctly established the initial relationship between the loudspeakers and listening chair, you should be able to experience Sonic Holography® almost right away.

First, take a couple of minutes to "preflight check" your stereo system:

1. Visually check out and confirm that all components are connected in phase (all left-channel outputs to left-channel inputs, right-channel outputs to right-channel inputs).
2. Check and confirm that the loudspeakers are properly wired in-phase (positive "+" loudspeaker outputs on the integrated amplifier should be connected to the positive terminals on the loudspeakers; negative "-" outputs to negative terminals on the loudspeakers).
3. If your system employs an external equalizer to flatten room response, we recommend that you switch it out of the integrated amplifier's signal path. Wait until you've had a chance to experience and experiment with Sonic Holography® before re-equalizing the room. Room response will also be altered by any sound treatments used to reduce room reflections, so wait until all phases of the set-up are complete to save time and trouble.
4. If you are using a record for a sound source, inspect the phono stylus and cartridge for proper phasing, wear, and tracking. A cartridge/stylus in poor shape can upset the balance of the program material before it gets to the rest of the stereo system. This can simulate certain acoustic problems that cause strong one-side imaging, with weak imaging on the other.
5. Set the CM-1090's BALANCE control to "center." Set the 3 tone controls to their center (12 o'clock) position.
6. Press the CM-1090's HOLOGRAM button.

7. Play a stereo recording with only a few instruments and the human voice for first-time attempts at Sonic Holography.®

You should now hear Sonic Holography® in action.

Fine Tuning

Carefully adjusting the following speaker parameters will result in the best possible holographic image:

1. Tilt-back angle and toe-in angles.
2. Distance of speakers and listening chairs from back walls.
3. Room reflections.

Tilt-back and toe-in angles. If you are in a seated position, decreasing the tilt-back angle of most typical speakers will result in more high frequency and less midrange energy at your listening position. It will also lower the soundstage closer to the ground. If you are in a standing position, these effects are reversed. Decreasing the tilt will result in less high frequency energy and will bring the midrange slightly forward.

It is possible to find a tilt-back angle that will allow the tonal balance to remain unchanged from sitting to standing. This specific angle may or may not result in the preferred tonal balance. We recommend that you determine your favorite tilt-back angle while seated. But remember, changing the tilt angle will also change the height of the sonic image. The less tilt, the higher the image. Increasing the tilt angle will, however, often enhance the dimensionality of the soundstage.

Toe-in (the lateral angle of the speakers) also affects Sonic Holography.® When experimenting with speaker angle, make sure that the speakers are equally toed in. This can be done by measuring the distance from the inner and outer corners to the back wall of the listening room.

Distance from back wall. The purpose of keeping the loudspeakers away from the walls is to provide a direct, speaker-to-ear sound path with a minimum of extra, unwanted reflections off surfaces in the room. Just as the second-sound arrivals confuse the ear in normal stereo playback, early arrivals of reflected sound can further confuse the issue and ruin attempts at creating holographic images. Always keep in mind the importance of accurate loudspeaker/ listening chair relationships, keeping the loudspeakers relatively close together (three to five feet, center-to-center).

Room reflections. For the best possible sonic hologram generation, the area around and behind your speakers should be relatively dead. If the back and side walls are too reflective, they may

generate additional sound reflections which can interfere with Sonic Holography.®

The object of acoustically treating the listening room is to create what's known as a "live end/dead end" configuration. This design makes the area around the loudspeakers acoustically "dead," while the area around the listener is kept "live." Thus random sound reflections reach a listener long after the direct sound, establishing a uniform sound field. The reflections most in need of correction in your listening room are the usually strong, side-wall reflections that originate from surfaces near each loudspeaker. Any treatment should be applied to the wall extending two feet above and below the midrange and high-frequency loudspeaker elements, standing two to three feet from the leading edge of the loudspeaker cabinet. The treatment itself may be quite simple. Open, full book cases or record shelves, heavy fabric hangings, or draperies made of heavy material will work well as an acoustic treatment for many situations. Sound panels made from cork or acoustical tile can be covered with a variety of other sound-absorbing materials, too. Since side-wall sound treatments are relatively small (usually less than four feet by four feet), you could use attractive grill cloths or foam panels to improve the appearance. However, loudspeaker grill cloths or covers are not, obviously, effective sound absorbers. Scrap carpeting can be effective when used with other sound-absorbing materials.

Be sure to deal with room reflections equally. If you eliminate the reflections from one wall and not the other, the resulting reflections will create an audible imbalance in the holographic image. The sound images will be well-defined on one side while smeared or fuzzy on the untreated side.

The wall directly behind the loudspeakers should also be as nonreflective as possible, particularly if loudspeakers have been placed a less-than-ideal distance away from it. If there's a large window between the loudspeakers, it should be covered with heavy draperies to reduce reflections off the glass. Of course, if there's no window to worry about, a wall can be treated with sound-deadening panels, or just book shelves and record cabinets extending vertically as high as possible, and completely between the loudspeakers.

Sound reflecting off a bare wood or tile floor can also reduce the Sonic Hologram effect even if the loudspeakers are properly elevated on stands. The only possible solution here is to cover the floor with shag or plush-pile carpeting. If installing wall-to-wall carpeting isn't on your agenda when installing your new Carver CM-1090, use a rug made from similar materials that extends from the base of each loudspeaker stand to a foot short of the listening chair. Upholstered, low furniture, placed somewhat in front of the loudspeakers can also break up floor reflections.

Room Examples

The first two sample rooms show the loudspeakers and listening chair in perfect positions for Sonic Holography.[®] But, as we've mentioned, it may not be practical to leave them there. It's your mission to find a point where considerations for successful Sonic Holography[®] can co-exist happily with the aesthetic considerations of room decor.

Look at the diagram of Room A. Here the loudspeakers project the long throw of the room, yielding a large front-to-back depth of the sonic stage. Room B, where the loudspeakers project the short span of the room, has exceptional sonic stage width and moderate front-to-back depth. Naturally the choice of positioning depends on your personal taste, as well as furnishings and overall room arrangement.

Sample Rooms C, D, E and F show configurations that won't work well with Sonic Holography.[®]

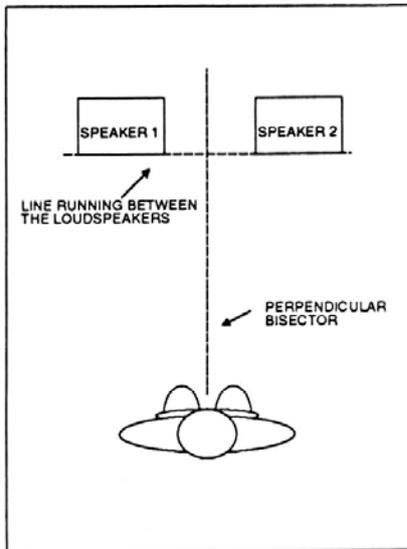


Figure 6 Room A

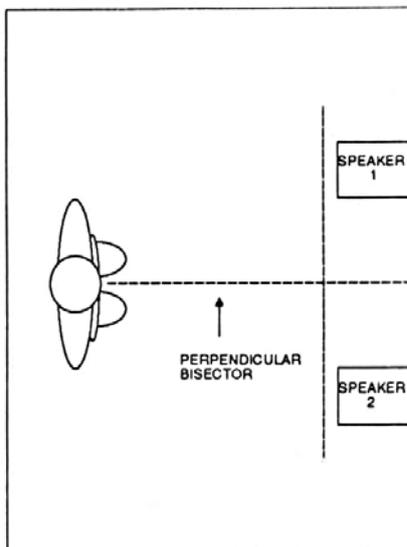


Figure 7 Room B

though these same set-ups are often quite acceptable for conventional stereo playback. Other than poor loudspeaker placement, side/boundary-wall reflections will destroy chances of a good holographic image taking form.

Better room arrangements are illustrated in Rooms G and H. Room H uses a "trick" to get the loudspeakers almost against the wall behind them. This consists of a sound-deadening panel placed behind the loudspeakers, right against the wall. We'll come back to Room H in a moment.

Refer again to the diagram of Room B which compares favorably to both Rooms G and H. What makes it so good for Sonic Holography[®]? First, as in the initial set-up, the loudspeakers are away from corners, side walls, and the wall behind the loudspeakers. The listener is seated with a reflective wall about one to four feet behind them. This places the listener in a sound field made up of direct sound from the loudspeakers and reflected sound from the rear wall.

In Room H, with the loudspeakers still away from the side walls and corners, the listener has a nearby rear wall to ensure front-to-back depth in the holographic image. As in any good placement for Sonic Holography,[®] the loudspeakers are toed-in toward the listening chair. This places the listener on-axis with direct sound from the loudspeakers, further reducing side-wall reflections at the same time.

Loudspeaker Designs and Early Reflections

The Sonic Holography[®] Sound Processing System uses signal delays of a fraction of a millisecond. In some loudspeakers, reflections with similar delays can be caused by protruding edge moldings, grillwork, or other front surface irregularities that might dilute an image in Sonic Holography.[®]

Most modern loudspeakers use sound absorbing materials, rounded corners, or even unconventional designs to reduce these early reflections. In all fairness, most loudspeakers with "conventional" front panels won't have any serious reflection problems that could hurt or weaken holographic images. However, if sound images remain fuzzy and unresolved, even with close attention to all other factors, there's a possibility it could be the result of early reflection off front-panel irregularities. The solution to this problem consists of placing a cut-out of acoustic felt around the various elements in your loudspeakers.

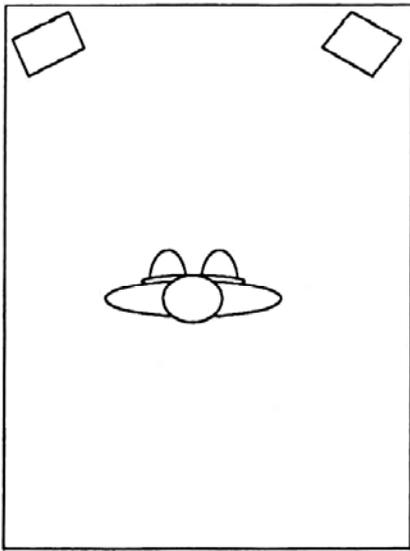


Figure 8 Room C

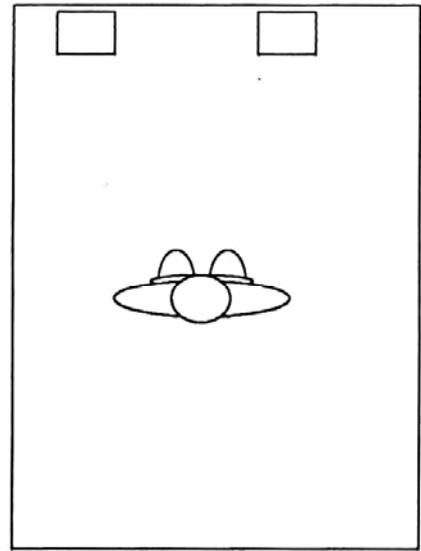


Figure 9 Room D

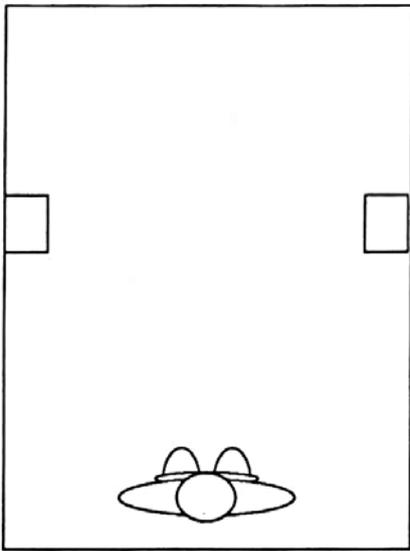


Figure 10 Room E

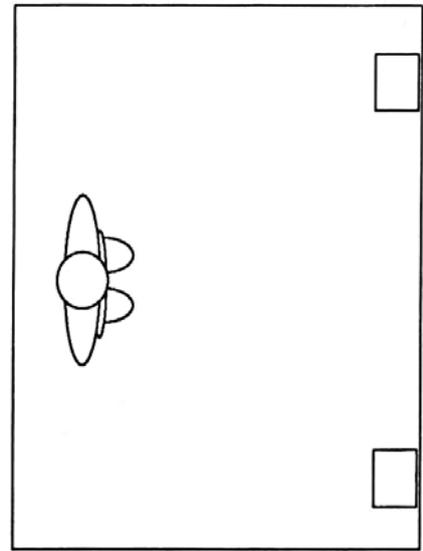


Figure 11 Room F

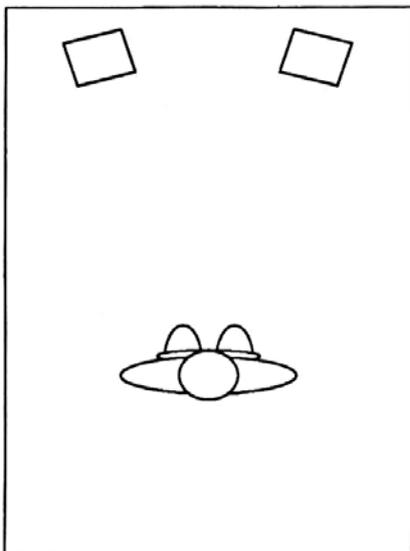


Figure 12 Room G

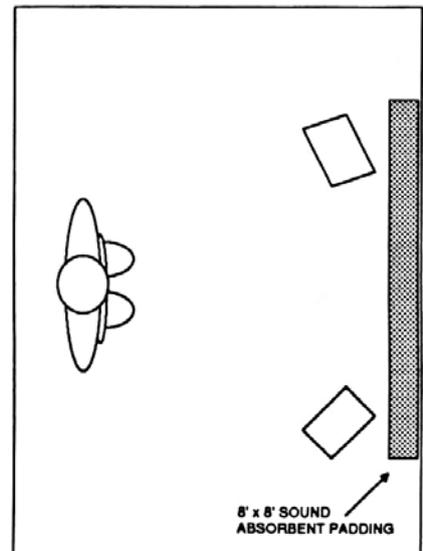


Figure 13 Room H

7. About Sonic Holography®

Sonic Holography® is a complex method of processing stereo signals which corrects the basic imaging flaw inherent in conventional stereo playback.

The problem with conventional stereo playback is that both ears hear the output of both loudspeakers. In order to understand why this is a problem, a comparison must be made between

the way we hear a stereo recording of a live event played back through loudspeakers, as opposed to hearing an actual sonic event. Consider Figure 14.

It shows what occurs during a live musical event. Each ear receives one sound arrival. The timing of these arrivals is processed by your brain and converted to information about where the music is coming from.

Figure 15 represents conventional stereo. The recorded sound of the band is reproduced by both left and right loudspeakers. If your left ear ONLY got a sound arrival from the left speaker and your

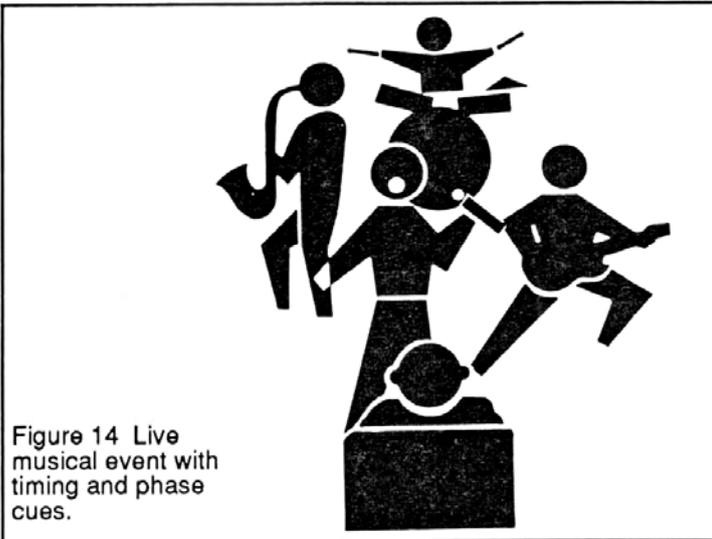


Figure 14 Live musical event with timing and phase cues.

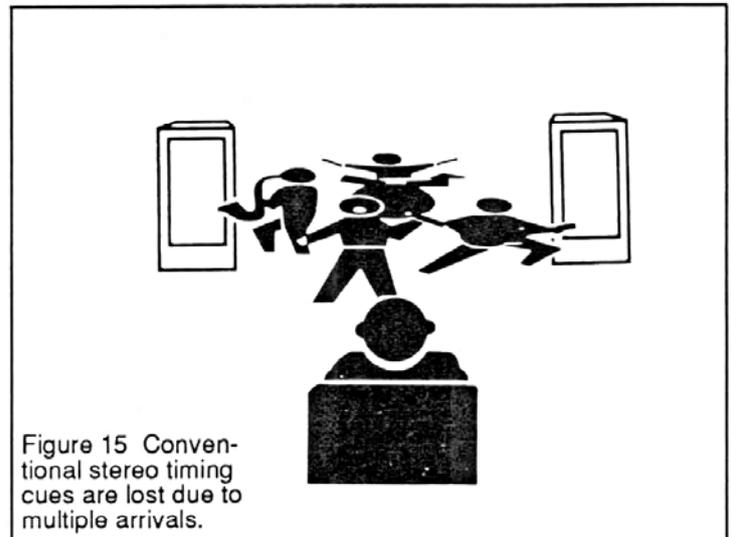


Figure 15 Conventional stereo timing cues are lost due to multiple arrivals.

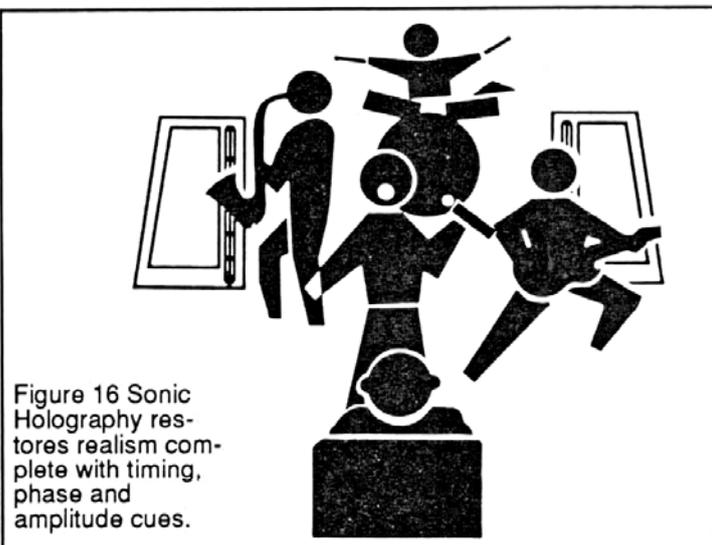


Figure 16 Sonic Holography restores realism complete with timing, phase and amplitude cues.

right ear ONLY got a sound arrival from the right speaker we wouldn't need Sonic Holography.® Unfortunately, each ear hears BOTH speakers. This results in each ear getting an extra, confusing sound arrival of information which contradicts the original position of the band. The best your brain can do is "construct" a fuzzy "stereo" image. This problem of FOUR total arrivals is, incidentally, why stereo is so much more pronounced when you listen to isolated stereo headphones.

To review what we've covered so far, in real life a sonic event (such as the band in our illustration) can never create more than TWO sonic arrivals:

One at the left ear and one at the right ear. Stereo playback through speakers causes FOUR arrivals. Those extra, second-sound arrivals confuse our ear/brain system, masking clues as to the exact positioning of the sound sources.

The CM-1090's Sonic Hologram Generator eliminates the extra sonic arrivals that occur in conventional stereo playback.

This is accomplished by canceling out the unwanted second-sound arrivals from each loudspeaker to the opposite-side ear (Figure 16). Each ear is then free to concentrate its attention on the same-side loudspeaker. In other words, your left ear hears just the left loudspeaker; your right ear hears just the right loudspeaker. This is

accomplished by electronically-generated crosstalk signals from each stereo channel and feeds them to the opposite-side channel. The signals your new integrated amplifier generate are virtually identical to the unwanted acoustic second-arrivals that confuse our ear/brain systems. The difference is that they're phase inverted. When these mirror-image signals are reproduced by the loudspeakers, they cancel the acoustic cross talk signals arriving from the opposite loudspeaker. Of course, this is a very simplified explanation of how the Sonic Holography® Sound Processing System works. In addition to the electronic crosstalk-signals, the CM-1090 uses delay timing and filtering circuits for creating the same types of filtering and delay caused by our heads.

8. Technical Information and Service Assistance

Specifications

General

Frequency Response: 20 Hz to 20 kHz + 1 dB.
Overall S/N: 85dB IHF A-weighted
IM Distortion (CCIR or SMPTE): less than 0.5%
THD: 0.05% or less, at rated power
TIM: unmeasurable
Weight: 21 lbs.
Dimensions: 4.5" H x 19" W x 14.5" D

Magnetic Field Power Amplifier Section

100 watts RMS per channel, both channels driven into 8 ohms from 20 to 20kHz with less than 0.1% THD. 150 watts RMS per channel, both channels driven into 4 ohms from 20 to 20kHz with less than 0.1% THD.

Preamp Section

Phono Gain: 36dB
Phono S/N: 78dB IHF A-weighted
Tone Control Turnover Frequencies: 100Hz, 1kHz, 10kHz
Sonic Hologram Generator Image Resolution: 5 horizontal, 20 vertical

Patent Notice

The circuitry and application of the CARVER Sonic Holography® Sound Processing System are protected by United States Patent Number 4,218,585 and corresponding foreign patents.

Cleaning

You'll want to wipe off the CM-1090's front panel and chassis from time-to-time with a soft, dry cloth. If you have something stubborn to remove,

use a mild dish soap or detergent sparingly applied to a soft cloth; don't use alcohol, ammonia, or other strong solvents.

Troubleshooting

If you're having trouble or suspect a problem, try some simple trouble shooting first. More likely than not, the problem lies elsewhere in the system — not with the CM-1090.

WARNING: NEVER replace or check a fuse while the unit is plugged into an AC outlet. The integrated amplifier must be turned OFF for at least one minute before any audio cables may be disconnected.

No lights from the meter display or the LEDs.

1. CM-1090 power off.
2. Line cord disconnected.
3. Poor fit between plug and wall receptacle.
4. Power off at wall receptacle. (Check with tester or lamp.)
5. Fuse is blown and needs replacement with one of the same rating.

No sound (power OK and on).

1. CM-1090 set to inactive output.
2. Either TAPE MONITOR button pushed in with no tape running.
3. SPEAKER A and/or SPEAKER B buttons not pushed in.
4. Selected input not functioning.
7. Speaker cables connected to wrong set of speaker outputs.

8. Program source misadjusted. For example, tuner is between stations, tape is on a blank segment, CD player is on pause.

Sound is very faint, even with volume control all the way up.

1. MUTING function on remote control has been engaged. Turn the volume back DOWN before turning off the MUTING function.
2. Wrong input selector button has been pushed.
3. Moving coil cartridge has been connected to PHONO inputs.
4. CD player with independent volume control is turned down.

No sound in one channel.

1. Defective cable from signal source to CM-1090.
2. Speaker wire loose or disconnected.
3. CM-1090 BALANCE CONTROL fully clockwise or counterclockwise.
4. Speaker fuse blown.

Loud howl, squeal or whistle.

1. TAPE MONITOR is engaged while microphones are connected to tape deck for recording.

Solo voices or instruments sound thin, shrill or distorted.

1. Treble controls set to maximum boost.
2. Phono cartridge wired out of phase.
3. Speakers are connected out of phase.

Sound is weak when PHONO is selected.

1. A moving coil cartridge has been connected to the moving magnet input. Add a passive or active step-up device.

Hum and constant noise.

1. Defective signal cables.
2. Improper fit between signal cable plug and sockets.
3. Signal cables have been routed too closely to AC cables, power transformers, motors or TV sets.

4. Turntable or cassette deck may be oriented in such a way that it is picking up induced hum from internal AC wall wiring. Change component's position slightly.

Intermittent noise, static or hum caused by RFI interference from CB, TV or AM radio.

1. Determine where the RFI is entering the system by disconnecting individual sound sources, then the CM-1090.
2. Use interconnect cables with better shielding.
3. Wrap turntable input cables in foil.
4. Place 0.01 microfarad capacitor across speaker terminals.

Remote control won't work.

1. Batteries are dead or missing.
2. Remote is too far from or at too much of an angle from the remote sensor on the CM-1090.
3. Remote sensor on CM-1090 or transmitter panel on remote are dirty.

Remote won't activate CD player.

1. Transport buttons on the CM-1090 work only with Carver CD players.

Service Assistance

We suggest that you read the LIMITED WARRANTY completely to fully understand what your warranty/service coverage constitutes, and its duration. You MUST promptly complete and return the WARRANTY REGISTRATION CARD to validate your LIMITED WARRANTY.

If your CM-1090 should require service, we suggest you first contact the Dealer from whom you purchased it. Should the Dealer be unable to take care of your needs, you may contact the CARVER Service Department by phoning (206) 775-6245, or by writing CARVER CORPORATION, Service Department, P.O. Box 1237, Lynnwood, WA 98046. We will then direct you to the nearest in our national network of Authorized Warranty Service Centers, or give you detailed instructions on how to return the product to use for prompt action.

We wish you many hours of musical enjoyment. If you should have questions or comments, please write to us at the above address.